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ABSTRACT

The Dental Auxiliary Department of the University of Puerto Rico designed a career option dental auxiliary training program which is a step ladder program with three exit points over a period of two academic years. The first option is a six-month track to train a traditional chairside dental auxiliary. The second option is a nine-month track to train an expanded-functions dental auxiliary in basic preventive and restorative dentistry. The third option is an eighteen-month track to train an expanded-functions dental auxiliary in advanced preventive dentistry and periodontics. The program is primarily designed for students who have a high school diploma. For the students in the experimental model of the program, sixty-six completed the program at the first level, thirty-five at the second level, and seven at the third level, as expanded-functions dental auxiliaries. The four sources of information used for evaluating student achievement showed that participants successfully mastered the necessary knowledge and skills for the three exit levels in the specified time. Graduated dental auxiliaries perceived themselves as well prepared for their duties. (LRA)

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PUERTO RICO EXPERIMENTAL MODEL DENTAL AUXILIARY TRAINING PROGRAM

The Comprehensive Report

Covers Period of Performance During

October 22, 1976 - February 24, 1980

Contract No. HRA-231-76-0079

Contractor

University of Puerto Rico
Medical Sciences Campus
G.P.O. Box 5067
San Juan, Puerto Rico 00936

Contractor's Project Director: Iris R. Pérez, D.M.D., M.P.H.

Sponsor

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Health Resources Administration
Room 322, Center Building
3700 East-West Highway
Hyattsville, Maryland 20782

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U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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SECTION I. PREFACE

Personnel who performed key functions in the planning and implementation of the Puerto Rico Experimental Model.

Project Officer

Dr. Richard Weaver, Chief, Professional Education Branch
Division of Dentistry
Bureau of Health Manpower, H.R.A.
Center Building, Room 322
3700 East-West Highway
Hyattsville, Maryland 20782

Advisory Group Members

John M. Coady - Assistant Executive Director of Education and Hospitals of the American Dental Association 211 East Chicago Ave., Chicago, Ill. 60611

Penny Miller - Director, Department of Dental Hygiene, College of Dentistry, University of Oklahoma 609 Forest Avenue, Fort Dodge, Iowa 50501

Ralph Lobene - Dean, School of Dental Hygienists, Forsyth Dental Center, 140 Fenway, Boston, Mass. 02115

Judy Nix - Director of Education, American Dental Assistants Association, 666 North Lake Shore Dr. Chicago, Ill. 60611

Bettie Underwood - C.D.A./R.D.A., Director, Dental Assisting Program, City College of San Francisco 1445 Carlos Court, Santa Rosa, Calif. 95405

Irene Woodall - Director, Division of Oral Hygiene, School of Dental Medicine, University of Pennsylvania 366 Bala Ave. Bala-CYNWYD, PA 19004

Terry Strong - Certified Dental Assistant and Consultant for A.D.A.A., P.O. Box 3675, Eugene, Oregon 97403

Dolores Malvitz - Director, Department of Dental Hygiene, College of Dentistry, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, Oklahoma 73190

Dental Auxiliary Department Members

A staffing chart is included as Exhibit A.

Name	Functional Title	Area of Responsibility	Year
1. Dr. Iris Pérez	Project Director	Developed and supervised all aspects of the model	1976-79
2. Mrs. Josephine Rosa	Assistant Project Director	Supervised aspects delegated by project director	1976-79
3. Dr. María S. Lacot	Educational Specialist	Curriculum development	1976
4. Dr. Miguelina Hernández	Evaluator	Curriculum evaluation	1977
5. Mrs. Maritza Hernández	Educational Specialist	Curriculum development	1976-77
6. Miss Sonia Negrón	Administrative Assistant	Budget accountability and processing of documents	1977-79
7. Dr. Víctor Fernández	Program Director	Administrative and academic functions	1977-79
8. Dr. Angel Aja	Instructor	Teaching	1976-79
9. Dr. Orlando Rojas	Instructor	Teaching	1976-79
10. Dr. Luis Arzola	Instructor	Teaching	1976-79
11. Mrs. Norma Santiago	Instructor	Teaching	1976-79
12. Mrs. Nilda McCormick	Dental Hygienist	Teaching	1976-79
13. Mrs. Lourdes Colón	Dental Hygienist	Teaching	1976-79
14. Mrs. Gloria Vázquez	Dental Hygienist	Teaching	1976-79
15. Miss Gloria Santiago	EFDA	Teaching	1976-79
16. Mrs. Carlota Pardo	EFDA	Teaching	1977-79

Name	Functional Title	Area of Responsibility	Year
17. Mrs. Madeline Pérez	EFDA	Teaching	1977-79
18. Mr. Juan de Dios Correa	Dental Technician	Teaching	1976-79
19. Mrs. Emilia Acevedo	Educational Specialist	Curriculum Development	1977-79
20. Mrs. Milagros Vélez	Secretary	Typing	1976-79
21. Miss Rosa L. Suárez	Secretary	Typing	1976-79
22. Dr. Andrés Collazo	Evaluator	Curriculum evaluation	1978-79
23. Mr. José Ruiz	Evaluator	Curriculum evaluation	1978-79
24. Dr. José M. Ducós	Instructor	Teaching	1978-79

LIST OF ABBREVIATIONS AND SYMBOLS

1. G.S.G.P.A. - High School Grade Point Average
2. G.P.A. - Grade Point Average
3. P.R.B.D.E. - Puerto Rico Board of Dental Examiners
4. Level I, Track A - Chairside Dental Auxiliary
5. EFDA Level I or Level I Track B - Expanded Functions Dental Auxiliary in Basic Preventive and Restorative Dentistry
6. EFDA Level II - Expanded Functions Dental Auxiliary in Advanced Preventive Dentistry and Periodontics

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SECTION II. ABSTRACT

The Dental Auxiliary Department of the College of Health Related Professions, Medical Sciences Campus of the University of Puerto Rico, planned, implemented and evaluated an experimental model for a career option dental auxiliary training program from October 22, 1976 to February 24, 1980. The schedule followed is included as Exhibit B.

Originally, the dental auxiliary program of the University of Puerto Rico, consisted of a nine month dental assisting program with expanded functions, and an eighteen month dental hygiene program. The two programs were not providing the appropriate type of personnel required in the Island.

Program evaluation brought about the need to continue exploring new ways of providing training for dental auxiliaries to better serve the manpower needed by the dental profession. A new scheme has been designed at the University of Puerto Rico in order to meet the needs for the different types of dental auxiliary personnel needed. See Exhibit C.

The project is a step ladder career options program which has three exit points over a period of two academic years. The first option is a six month track to train a traditional chairside dental auxiliary. The second option is a nine month track to train an expanded functions dental auxiliary in basic preventive and restorative dentistry. The third option is an eighteen month track to train an expanded functions dental auxiliary in advanced preventive dentistry and periodontics. The program was primarily designed for students who had a high school diploma.

The established program allowed participants to exit training at various levels. Sixty-six participants completed their training as traditional chairside auxiliaries. Thirty-five of them completed their training as expanded-functions dental auxiliaries in basic preventive and restorative. Seven of these, completed their training as expanded-functions dental auxiliaries in advanced preventive and periodontics.

The faculty of the two different dental auxiliary programs was integrated into the new program, allowing for a more effective personnel utilization and consequently lower operational costs.

In order to develop a career-options curriculum that may serve as a National Model for the development of similar expanded-functions dental auxiliaries training program within continental U.S.A., efforts were made to obtain an accreditation status from the Commission on Dental Accreditation of the American Dental Association. After curricular modifications and two site evaluation visits of a committee of the Commission on Dental Accreditation, the dental assisting and dental hygiene phases of the program have each received the accreditation status of "approval".

The four sources of information used for evaluating students' achievement--grades distribution, results of comprehensive tests, instructors' ratings and the results of the P.R.B.D.E. certifying tests--showed that participants successfully mastered the necessary knowledge and skills for the three exit levels in the specified time.

Graduated dental auxiliaries perceived themselves as well prepared for their duties by the time they started working and were satisfied with the program. This finding also demonstrated that the program was successful in attaining its expectations.

The attrition rate increased from 15 percent in the traditional programs to 17 percent in the experimental one. Academic deficiencies were the reasons of most of the students who dropped. The causes for the increase in the attrition rate were not clearly known.

SECTION III. INTRODUCTION

Rationale of the Program

Puerto Rico has undergone a socioeconomic revolution during the past four decades that has converted the Island from a predominantly agrarian to a highly industrial economy. The per-capita income has risen from $118 to $1,400 during the 30-years period between 1940-70: yet, about 2/3 of the Island's population has a family income of less than $6,000 per year, for which it is regarded as medically indigent.

The most significant advances during this period have been made in the fields of health and education. The Island boasts of having the highest life expectancy and the lowest death rate in all Latin America. Life expectancy has risen from 41 to 72 years and the death rate has been lowered significantly. Infectious diseases such as malaria, tuberculosis and penumonia, principal causes of death in the 30's, are practically non-existent today. Leading killers are heart disease, cancer, and accidents of all types.

All medically indigents (2/3 of the total population) receive government health care, while the remaining one-third is served by the private sector.

Rough estimates indicate that approximately $600 millions were invested in health care and dental health services in Puerto Rico during the year 1973, as follows:

SERVICES	TOTAL	PUBLIC	PRIVATE
All health services	$600 M/S	200 M/S	400 M/S
Dental health services	$ 50 M/S	3.2 M/S	46.8 M/C

The above figures clearly depict an urgent need for increasing government-sponsored dental health services to that part of the Island's population regarded as socioeconomically deprived.

The dental health profession is entrusted, within the health care delivery system, with the responsibility of providing the best possible dental services, and for maintaining the oral health of the population in optimal conditions. The degree to which the dental profession can meet this challenge is dependent, to a large extent, upon:

1. the needs and demands of the population for dental services
2. the availability of trained dental-health manpower
3. the efficiency of the oral health-care delivery system, and
4. the operational costs of oral health care

Present conditions in regard to oral health in Puerto Rico reveal that:

1. The Island lacks the necessary trained manpower at the professional and subprofessional levels.
2. The available, limited dental health manpower is poorly distributed in the Island.
3. The Puerto Rican population is in great need for dental services. The projected increase in the number of graduating dentists at the School of Dentistry, University of Puerto Rico (sole training institution in the Island), for the next decade, will continue to fall short of significantly contributing to the solution of the existing manpower shortage at the professional level.
4. The prevalent oral health delivery system in Puerto Rico, has not reached the expected level of efficiency, and the dental

profession, as it stands today, cannot cope with the present and projected needs and demands for dental services.

The above conditions depict an imbalance between the needs of the population for adequate high-quality dental health services, the demand for such services and the available facilities for supplying the required dental health services.

A number of social changes in recent years have contributed to make the situation more critical:

1. There seems to be a growing feeling among the Island's population toward considering dental services not as a privilege for a selected group, but rather as a right for all people.
2. An increased number of third-party payment health plans and the introduction of new ways of financing dental care have, likewise, increased the demand of the Puerto Rican people for dental health services.
3. The expected implementation of a Universal Health Plan on the Mainland and in Puerto Rico will provide a strong challenge to the dental profession, as the latter would have to be more responsible to the public in providing comprehensive dental services to a larger segment of the population.
4. Population increases, better educational opportunities and improved economic conditions in the Island are positive factors toward an increasing demand for dental health services.

The following are possible alternatives for coping with the present and projected demands for oral health care in the Island:

1. Training new types of dental auxiliary personnel with expanded functions in the different dental specialties at the shortest period of time.
2. Optimizing the utilization of dental auxiliary personnel by delegating to them certain intraoral functions that formerly were of the exclusive domain of the dentist and organizing the delivery of oral health care under the TEAM concept.
3. Establishing group dental practices, both as a means of capitalizing on efficiency and optimal utilization of resources and as a means for reducing costs.
4. Utilization of hospitals as primary facilities for providing ambulatory dental care.

Formal training of dental auxiliaries at the University of Puerto Rico was initiated during academic year 1967. Dental-assisting training program of a nine-month duration were followed by a two-year training program for dental hygienists in 1968. Ammendments to the Puerto Rican law regulating the dental profession made it possible in 1972 for all certified dental assistants to receive training in the areas of expanded functions. This training began with a pilot group of five students in academic year 1973.

A complete restructuring of both, the Dental Assisting and Dental Hygiene Programs, was agreed upon by the School's administration in academic year 1975, based on the following premises:

1. There is a felt need in Puerto Rico for providing the dental profession, both in government service and in private dental practice, with well-trained, competent dental auxiliaries at various training levels, in the shortest time possible.

Neither the number nor types of yearly graduates of dental assisting and of dental hygiene were sufficient for meeting the present or projected demands in dental health care in the Island.

2. Three of the five health regions in the Island (Northern, Western, and Southern) are in great need of dentists and dental auxiliaries. It is imperative that efforts be made to make available, at the earliest, this badly needed personnel.
3. The number of graduating dentists at the School of Dentistry and other dental schools abroad will continue to be, at least for a number of years, too limited to cope with the population's demand for dental health services. This implies that dental auxiliaries will need to be utilized by dentists to the fullest.
4. Third-party-payment health plans, such as SSS, Blue Cross, and Blue Shield; Social Security medical plans (Medicare) and the expected implementation of a Universal Health Plan in the Island have increased, and will continue to increase, the demand by the population for dental health services. Dentists will have to rely more and more on their dental auxiliaries for the performance of functions that were formerly of the domain of the dentist.
5. Recent changes in the training of the dentist require that the training of the dental auxiliaries in Puerto Rico include the phase on expanded functions.
6. All dental practitioners in Puerto Rico, in government or private practice, do not require the services of EFDAs.

Competent chairside, four-handed dentistry auxiliary personnel may render necessary services to the dental profession. Examples are:

a. group dentistry, where a number of auxiliaries serve a group of dentists and

b. dentists who are initiating their careers.

Training of dental auxiliaries made the area in expanded functions compulsory for all trainees; that is, an across-the-board training. It did not provide for exit into the work market of those interested students, and particularly, for those capable of performing only as traditional chairside auxiliaries, thus limiting their educational opportunities. It was considered as highly desirable that training of dental auxiliaries be offered at different levels to meet present demands and those of the forseable future in the island.

7. Training of dental hygienists required two academic years.

Their training requirements were more limited in the area of expanded functions than that of the dental assistants, taking only nine (9) months. Many dental hygienists must perform, in actual dental practice, functions corresponding to dental assistants. It is regarded as necessary that in Puerto Rico, all dental auxiliaries be trained initially for dental-assisting functions and that those who wish to continue more advanced training be offered such opportunities in the dental auxiliary field.

8. The need for increasing the number of graduating trainees in

the dental auxiliary field in Puerto Rico required the most productive and efficient utilization of the participating professional and supporting faculty. The restructuring of the dental-assisting and dental-hygiene training programs into one auxiliary training program is regarded as a way to increase the potential of the available personnel in such training.

9. The various knowledgeable and interested professional groups and related government agencies in the field of dental health are well acquainted with the need to provide, at the earliest, high-quality, competent dental auxiliaries required by the profession, in such numbers that may allow for successful delivery of dental health services. The Department of Health of Puerto Rico, the Puerto Rico College of Dental Surgeons, and the Puerto Rico Board of Dental Examiners have given full endorsement and support to the restructuring of the program.
10. TEAM-oriented dental education at the School of Dentistry of the University of Puerto Rico, and in many other similar Mainland institutions, makes it imperative to provide the dental profession with competent dental auxiliaries for satisfactory delegation of functions which were previously performed by the dentist exclusively.

Origin of the Program

The Dental Auxiliary Department of the College of Health Related Professions, Medical Sciences Campus at the University of Puerto Rico, initiated the planning stage of an experimental model for a dental auxiliary training program on October 22, 1976, aiming to overcome the following existing limitations of the former programs:

1. Dental hygienists were trained during a two academic year period with less expanded functions than the dental assistants, whose training only required a 9-month period.
2. Dental assistants were trained to perform as chairside and expanded functions dental auxiliaries in a nine-month program. It did not provide for the training of students particularly interested or only capable of performing as chairside four-handed dentistry assistants.
3. The available dental faculty and administrative personnel in charge of the dental auxiliary training programs at the School of Dentistry were too limited for the adequate operation of these programs independently. This did not allow for, nor encouraged effective faculty utilization for optimal program operation.
4. The two dental auxiliary training programs were not providing the appropriate type of auxiliary personnel required by private and public dental practitioners in the different types of communities in Puerto Rico.

The director of the Dental Auxiliary Department developed a plan for the establishment of the administrative structure and for the utilization of personnel required in the program. A Steering Committee was appointed which had the following positions: project director, project sub-director, curriculum specialist and evaluator. This committee had the following responsibilities:

1. Establish program philosophy and general guidelines.
2. Design the curriculum.
3. Establish criteria for admission, retention, promotion and graduation.

4. Design the program evaluation plan.

5. Evaluate program development.

6. Decide on changes to be implemented.

Three dental auxiliary types were conceptualized and their corresponding functions were assigned. Tasks associated with those functions were identified and analyzed using as a resource the Matrix of Dental Auxiliary Performance Tasks of the State Consortium on Dental Auxiliary Education of Kentucky.[1]

The next step was to establish the objectives and content needed in developing those tasks. The previous accredited dental assisting and dental hygiene programs of the University of Puerto Rico were reviewed for this purpose. Those objectives and contents which were essential for a dental auxiliary to perform the desired tasks were selected and incorporated into the new program; new ones were also incorporated. In essence, the objectives and contents were reviewed, classified as "need to know" and as "nice to know" and organized into courses.

The courses were designed in a manner which provided interrelation between them for attaining a more effective learning experience. The ADHA Curriculum Essentials for Dental Hygiene Education[2] was used as a source of information in course design. The curriculum sequence was considered for establishing performance standards: content or behavior relevance

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[1]State Consortium on Dental Auxiliary Education, Kentucky. Matrix of Dental Auxiliary Performance: Tasks of the State Consortium on Dental Auxiliary Education. Kentucky, 1975.

[2]American Dental Hygienists Association. Curriculum Guidelines for Dental Hygiene Education: Performance Standards Based on Tasks Analysis and Instructional Objectives, 1977.

and degree of difficulty. Proficiency levels in clinical courses were based on the degree of difficulty and the possible effect a procedure might have on a patient's welfare.

The resulting curriculum is a modified, competency based and task oriented one. It is not totally competency based as the courses are not flexible, following the traditional quarter system. In addition, the students are not able to proceed at their own speed. However, they have to meet specified performance standards for successful completion of a course.

An Advisory Committee met four times in Puerto Rico with the project officer, project director and some staff members to critically review the project progress. This committee was appointed by the project director and the project officer and its members were:

John M. Coady - Assistant Executive Director of Education and Hospitals of the American Dental Association

Penny Miller - Director, Department of Dental Hygiene, College of Dentistry, University of Oklahoma

Ralph Lobene - Dean, School of Dental Hygienists, Forsyth Dental Center

Judy Nix - Director of Education, American Dental Assistants Association

Bettie Underwood- C.D.A./R.D.A., Director, Dental Assisting Program, City College of San Francisco

Irene Woodall - Director, Division of Oral Hygiene, School of Dental Medicine, University of Pennsylvania

Terry Strong - Certified Dental Assistant and Consultant for A.D.A.A.

Dolores Malvitz- Director, Department of Dental Hygiene, College of Dentistry, University of Oklahoma Health Sciences Center

An additional meeting for curriculum planning was conducted at the American Dental Association Headquarters in Chicago where some of the advisory group members worked with some members of the staff of the Dental Auxiliary Department and with the Project Officer.

The training program was developed at the facilities of the School of Dentistry. The dean of the College of Health Related Professions was responsible for the overall program development, in close coordination with the dean of the School of Dentistry.

General Program Description

This project is a step ladder career options program which has three exit points over a period of two academic years. The first option is a six month track (Level I, Track A) to train a traditional chairside dental auxiliary. The second option is a nine month track to train an expanded functions dental auxiliary in basic preventive and restorative dentistry (EFDA Level I or Track B). The third option is an eighteen month track to train an expanded functions dental auxiliary in advanced preventive dentistry and periodontics (EFDA Level II).

Program Participants Description

The program was primarily designed for students who had a high school diploma. They were selected for the academic year 1977-78 by using as criteria the high school grade point average (H.S.G.P.A.) and the results of an interview. The College Entrance Examination Board (CEEB) test results were required but not used in the selection process.

The H.S.G.P.A. of the admitted students for the 1977-78 academic year varied from 2.37 to 4.00 on a scale of 4.00 with a mean of 3.04. Their CEEB scores varied from 1112 to 1971 with a mean of 1435. The H.S.

G.P.A. of the 1978-79 group varied from 2.53 to 3.83 with a mean of 3.13. Their CEEB scores varied from 1050 to 2035 with a mean of 1209.

The criteria used for admission to EFDA Level I included the G.P.A. in the first trimester of this program, the rank in the core subject (Chairside Assisting/Dental Materials/Dental Procedures), the scores of a standarized English comprehension test, the faculty recommendations and the scores of a comprehensive test.

The EFDA Level II students were chosen from applicants who had EFDA Level I training. The criteria for admission included G.P.A., staff recommendation, peer recommendation and the scores of a comprehensive test.

SECTION IV. TRAINING PROGRAM

Program Goals

The Puerto Rico Experimental Dental Auxiliary Training Program aims to provide the Puerto Rican community with the necessary auxiliary personnel needed by government and private dental practitioners for satisfactory oral health delivery.

The Program is aimed toward the following goals which are based on the actual needs and expectations of the profession in Puerto Rico.

1. Train dental auxiliary personnel to perform as traditional chairside auxiliaries, as EFDAs in basic preventive and restorative dentistry, and as EFDAs in advanced preventive dentistry and periodontics.
2. Develop a career options dental auxiliary curriculum that will allow program participants to exit training at various levels for successful performance as dental auxiliaries for different types of services as needed by government and private dental practitioners.
3. Provide a career-option level for interested graduates of the above training programs leading to an Associate Degree in the Health Sciences.
4. Provide traditional dental auxiliaries in the work force with the opportunity to continue training to become EFDAs in basic preventive dentistry and restorative dentistry or EFDAs in advanced preventive dentistry and periodontics.

5. Provide the dental profession with trained dental auxiliaries of different levels of proficiency suited to the particular needs of practicing dentists in the delivery of dental health services.
6. Develop a high-quality dental-auxiliary training program at the Medical Sciences Campus of the University of Puerto Rico at the least expense possible.
7. Integrate the faculty of the traditional dental-auxiliary training programs into the dental auxiliary career options training program to allow more effective personnel utilization for optimum program development.
8. Provide interested high school graduates with a varied number of career options in the dental auxiliary field for a program selection that is more suitable to their particular needs, interest, and potential.
9. Develop a career-options Dental Auxiliary curriculum that may serve as a national model for the development of similar EFDAs training programs within the continental U.S.

Program Objectives

The objectives that guided the development of the program were subdivided according to the corresponding career options: Level I - Track A, Level I - Track B, and Level II.

Chairside Dental Auxiliary (Level I, Track A)

The chairside auxiliary is considered essential for a dental practitioner to operate efficiently. She/he is the one who must be prepared to assist him with patients at all times; be able to anticipate his needs

and prepare for them; be prepared to aid the dentist in the preparation of diagnostic aids; be prepared to perform supportive functions which are essential in a dental practice.

Furthermore, the chairside dental auxiliary must be able to carry out routine office management procedures; possess knowledge of basic laboratory procedures; and possess a feeling of commitment to her/his work, loyalty to her/his employer and a sensitivity to patient's needs.

The tasks identified for Level I Track A were the following:

1. Assist in the oral and dental examination

    a. chart oral conditions as dictated
    b. chart oral cancer inspection
    c. obtain and record medical, dental, and personal history

2. Assist with the administration of local anesthesia

    a. load and unload syringe
    b. pass topical anesthesia
    c. set up tray
    d. transfer instruments
    e. observe patient reactions

3. Assist with rubber dam

    a. select clamps
    b. set up tray
    c. assist with application
    d. assist with removal

4. Assist in restorative procedures

    a. clean and lubricate handpieces and contra-angles
    b. set up cutting instruments tray
    c. mix and deliver amalgam, cements and composite resin
    d. transfer instruments

5. Assist in oral surgery

    a. set up surgical tray
    b. transfer instruments

6. Assist in endodontics

    a. set up endodontic tray
    b. transfer instruments

c. manipulate dental materials
d. sterilize-glass bead
e. take and develop endodontic x-rays

7. Assist in prosthodontics

a. set up prosthodontics tray
b. transfer instruments
c. manipulate impression materials
d. prepare dental laboratory cases for delivery
e. maintain dental laboratory

8. Assist in orthodontics

a. set up orthodontic tray
b. transfer instruments
c. manipulate periodontal packs

9. Assist in periodontics

a. set up periodontic tray
b. transfer instruments
c. manipulate periodontal packs

10. Assist in pedodontics

a. set up pedodontic tray
b. transfer instruments
c. manipulate dental materials
d. manage patients (behavioral)

11. Assist with dental and medical emergencies

a. locate and operate emergency equipment
b. take blood pressure, pulse and respiratory rate
c. manage patient (behavioral)

12. Maintain a clear field

a. retract patient's cheek, lips, tongue and oral tissues
b. irrigate oral cavity for rinsing
c. insert and remove cotton roll
d. apply air to dry cavity preparation
e. apply saliva ejector
f. apply sponges

13. Control disease transmission

a. clean and disinfect dental operatory
b. reduce bacteria of skin
c. protect self and others
d. maintain asepsis while handling sterile items
e. prepare instruments for sterilization

14. Transfer instruments (four-handed dentistry concepts) in restorative, oral surgery, endodontics, prosthodontics, orthodontics, periodontics, and pedodontics.

15. Manage the patient

    a. receive patient: greet, escort, seat and prepare him.
    b. position patient
    c. dismiss patient

16. Disclose patient's teeth

    a. give disclosing tablet
    b. have patient rinse once

17. Identify plaque

    a. have patient check teeth with mouth mirror
    b. point out red areas on teeth after disclosing
    c. explain the possible harmful effects of the bacterial plaque

18. Demonstrate the toothbrush

    a. explain characteristics of a proper toothbrush
    b. demonstrate roll toothbrushing technique on models
    c. demonstrate use of floss on models
    d. have patient practice toothbrushing and flossing on models and on self

19. Take vital signs such as blood pressure, pulse and respiratory rate

20. Expose and process intraoral radiographs

21. Pour and trim study casts

22. Fabricate custom trays for impressions

23. Clean and polish removable restorations

24. Maintain person to person office communication

    a. receive patients and visitors
    b. schedule appointments
    c. collect fees and issue receipts
    d. dismiss patients

25. Maintain general office communication

    a. receive telephone calls
    b. place telephone calls
    c. sort incoming mail

26. Control appointments

    a. schedule appointments
    b. call to confirm appointments
    c. maintain call list to fill broken/cancelled appointments

27. Maintain, organize and file records in regards to patient treatment records, patient radiographs, patient financial records, recall cards, financial agreements, and insurance forms.

28. Assume ethical responsibilities in regards to self, profession and community.

29. Assume legal responsibilities

    a. acquire and maintain a license to practice
    b. practice within legal limits of the commonwealth laws

In order to attain this profile, the following general and specific objectives were developed.

General objectives

At the completion of Level I, Track A, the student will:

1. utilize and apply chairside procedures in the various specialties in dentistry.
2. utilize and apply principles involved in the functions associated with chairside support.
3. assist the dentist in gathering and recording diagnostic data.
4. assist the dentist in rendering preventive services in the area of plaque control.
5. perform basic laboratory procedures.
6. develop knowledge of the expanded concept of prevention at different levels in the natural history of dental disease in order to get awareness of her role as a team member in the area of prevention.

7. develop competencies in administrative procedures included in patient management and dental office.
8. exhibit an ethical behavior and understand the legal framework of dentistry in order to conform to stated rules and regulations.
9. establish proper rapport with patients.
10. exhibit a harmonious working relationship with other members of the dental health team.

Specific objectives

At the completion of Level I, Track A, the student will:

1. develop needed knowledge in order to apply correctly the concepts related to the way bacteria cause disease, disease transmission, body resistance and response to irritation, normal flora of the mouth and pathogenic organisms.
2. evaluate tooth nomenclature and structural form of teeth in relation to their functional alignment in the dental arches.
3. develop knowledge about the principles and procedures necessary for accurately exposing, processing and mounting radiographs and will exhibit professional judgment in the interpretation of radiographs for preliminary diagnostic reading.
4. acquire knowledge of basic dental equipment and its maintenance and develop skills relative to patient and dental auxiliary positioning, instrument transfer techniques, tray set up preparation for specific dental treatment procedures, and the manipulation of the dental material used in these procedures.
5. develop integrated knowledge of anatomy and physiology and relate this knowledge to the delivery of dental services.

6. be aware of the interaction of the many forces that contribute to the uniqueness of every individual.
7. gain a better understanding of the motives that guide human behavior and thus improve their insights and techniques in dealing with people and develop strategies to deal effectively with individuals deviating from the accepted and expected norms.
8. understand and accept the importance of the preventive measures in the maintenance of his optimal oral health.
9. develop the necessary skills for successful performance as a chairside assistant in various types of dental clinics such as DAUP, Orthodontics, Oral Surgery, Endodontics, Periodontics, Prosthodontics, Restorative, Pedodontics, and Radiology.

EFDA in Basic Preventive and Restorative Dentistry (Level I, Track B)

The expanded functions dental auxiliary must possess all the training and qualities of the chairside dental auxiliary, plus additional training to develop skills in basic preventive and restorative dentistry. This will liberate the dental practitioner from reversible restorative and preventive procedures, enabling him to increase his productivity.

The tasks identified for EFDA in basic preventive and restorative dentistry are the following:

1. All tasks delegated to the traditional chairside auxiliary
2. Make impression for study casts
3. Place, insert, and carve amalgam restorations
4. Place cement bases, cavity liners, and cavity varnish
5. Remove excess materials
   a. temporary crowns, etc.
6. Place and remove temporary restorations

a. ZOE
b. Zinc Phosphate

7. Polish coronal surfaces of teeth

a. remove dental plaque
b. remove dental stains

8. Polish fixed appliances

9. Polish restorations

10. Apply anticariogenic agents topically

a. fluorides
b. occlusal sealants

11. Desensitize hypersensitive teeth

12. Remove surgical sutures

13. Apply and remove rubber dam

In order to attain this profile, the following general and specific objectives were developed.

General objectives

At the completion of Level I, Track B, the student will be able to:

1. perform all the tasks delegated to the chairside dental auxiliary.
2. perform therapeutic services in primary preventive dentistry.
3. perform therapeutic services in surgical dentistry.
4. perform therapeutic services in restorative dentistry.
5. perform diagnostic services not delegated to the chairside dental auxiliary.

Specific objectives

At the completion of Level I, Track B, the student will:

1. possess the necessary perceptomotor skills and a critical and autoevaluative mind in the utilization and manipulation of

instruments and materials used during the different restorative procedures.

2. develop knowledge and skills in applying preventive measures such as polishing coronal surfaces of teeth, application of anticariogenic agents and sealants, impression making, and suture removal.
3. recognize the anatomical structures of neck and head and their relevance in dental care.
4. evaluate basic concepts of the morphology and functions of the primary oral tissues and of the development and histology of the face and oral cavity.
5. describe the common developmental disturbances of the face and teeth and oral manifestations representing some systemic disorders.

EFDA in Advanced Preventive Dentistry and Periodontics (Level II)

The expanded functions dental auxiliary on advanced preventive dentistry and periodontics has the training of the chairside dental auxiliary and of the EFDA in basic preventive and restorative dentistry. In addition, she/he is trained in specialized functions in the field of Preventive Dentistry and Periodontics. She/he must be prepared to organize plaque control programs in the private and governmental sectors.

The tasks identified for Level II to be performed under the supervision of a dentist were the following:

1. Obtain and interpret a medical, dental and personal history.
2. Perform a general appearance exam.
3. Perform preliminary intra and extraoral exam.
   a. visual

b. palpation

c. assess occlusal status

4. Perform preliminary intraoral hard tissue exam:

a. visual

b. tactile (locate deposits and stains)

c. detect caries

5. Perform intraoral chartings

a. periodontal

b. plaque indices

c. bleeding points

d. adult dentition

6. Detect deposit retention factors

a. teeth and appliance

b. salivary consistency

c. non-normal chewing

7. Detect oral habits

a. deviant swallowing

b. digital sucking

c. clenching

d. bruxism

e. tongue thrust

f. mouth breathing

8. Detect supragingival and subgingival calculus

9. Detect periodontal pocket depth

10. Remove supragingival and subgingival calculus

a. select proper instruments
b. use order of instrumentation to minimize time and trauma

c. apply scalers
d. apply curets
e. apply ultrasonic scaler

11. Perform root planing and soft tissue curettage

a. select proper instruments

b. use order of instrumentation to minimize time and trauma

12. Apply post-op medicaments and procedures

a. remove and apply periodontal packs
b. give post-op instructions

13. Perform a nutritional analysis

a. instruct patient in recording food diary
b. evaluate patient's diary

1) adequacy of foundation foods
2) frequency of sweets

c. counsel patient

1) "why" of the diet
2) "what" of the diet

d. educate patient in role of sugars in dental disease
e. follow-up counseling

14. Perform diagnostic testing

a. take a sample of the patient's dental plaque and prepare a slide for phase microscope.
b. prepare a viscosity and flow test.
c. prepare, incubate and interpret the snyder test.

15. Develop and implement individualized patient's education program.

a. dental office setting

1) assess patient's individual needs
2) plan, develop and evaluate effectiveness of educational program for individual patient.

b. community setting

1) identify community target groups
2) assess target group oral health needs to determine priority needs
3) assess community resources
4) plan educational program

5) implement educational program
6) evaluate the effectiveness of the program
7) alter programs to improve effectiveness

In order to attain this profile, the following general and specific objectives were developed.

General objectives

At the completion of Level II, the student will be able to:

1. perform all the tasks and services authorized to the traditional chairside auxiliary and to the EFDA in basic preventive and restorative.
2. perform therapeutic services in periodontics.
3. perform diagnostic services not delegated to the EFDA in basic preventive and restorative.
4. perform as dental health educator in the private group and community practice setting.
5. perform services to patients with special needs.

Specific objectives

At the completion of Level II, the student will:

1. identify current social changes and the biosocial political and cultural factors that affect health in the modern society.
2. participate effectively in the planning, development and evaluation of oral health educational programs.
3. express concern for individual's wellbeing and show interest in them as individuals.
4. utilize and apply knowledge relative to the normal condition of the periodontium and deviations from the normal, including etiological aspects, preventive measures, and surgical procedures involved in the treatment of periodontal disease.

5. develop skills for performance of clinical procedures such as: obtaining and interpreting a personal, medical, and dental history; dental charting, classification of calcareous deposits, root planing and soft tissue curettage, placing periodontal pack; ultrasonic scaling, and diagnostic aids.
6. evaluate the basic concepts in classification, methods of administration, uses, effects and damages of drugs commonly used in dentistry.
7. develop knowledge of basic concepts of modern theoretical and descriptive chemistry needed for the understanding of basic concepts of dental treatment.
8. develop the appropriate knowledge relative to the nature and characteristics of handicapped patients and provide quality oral hygiene treatment showing patience, understanding and reassurance toward them.
9. achieve an appropriate understanding of both biochemical and nutritional aspects of nutrients and foods and utilize this knowledge in the interpretation of dietary histories and dietary counselings of patients.
10. analyze dental health needs and attitudes of the community and suggest sound approaches to be taken for their correction.
11. develop awareness as to the importance of keeping informed and up-to-date in the field of dental health through the study and interpretation of scientific literature and development of the necessary skills for successful performance in their area.

12. utilize and apply with accuracy the basic principles of instrument design in the performance of oral prophylaxis, root planing, and soft tissue curettage.
13. utilize and apply with accuracy the knowledge from related basic and dental sciences for the gathering of diagnostic data such as health histories, oral inspection, and oral health indices.

Program Sequence

The courses were designed in a manner which provided interrelationship between them for attaining a more effective learning experience. Curriculum sequence was considered to be extremely important and overlap in content had to be controlled due to time limit. See Exhibit D for content display. Courses distribution and scope of training program are included in Exhibit E. Individual courses outlines of Level I Track A and B and Level II are included in Exhibit F.

SECTION V. PROGRAM EVALUATION

Purposes of the Evaluation

The purpose of the evaluation was to assess the overall effectiveness of the program. It was primarily summative, as it was mostly directed toward a general assessment of the larger outcomes of the project or substantive parts of it.

Evaluation was defined as the "process of delineating, obtaining and providing useful information for judging decision alternatives".[3] It included the specification and collection of information for determining the degree to which the program goals and objectives were attained. This in turn provided the basis for judging program decision alternatives.

Several decision alternatives were defined during the first stages of this project. Some of them pertained to general aspects of the program and demanded great effort and time to judge. A general decision might be to continue or discontinue the program; or it might be to modify all or part of it. Other decision alternatives were very specific and judgment was easier and quicker. Specific changes might be in the following aspects:

1. admission criteria to be applied at some or all of the training levels
2. courses required

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[3]Phi Delta Kappa National Study Committee on Evaluation. Educational Evaluation and Decision Making, Itasca, Ill.: F.E. Peacock, 1971, 40-47.

3. course content, requirements or sequence
4. teaching processes
5. teaching resources
6. time required for each exit level

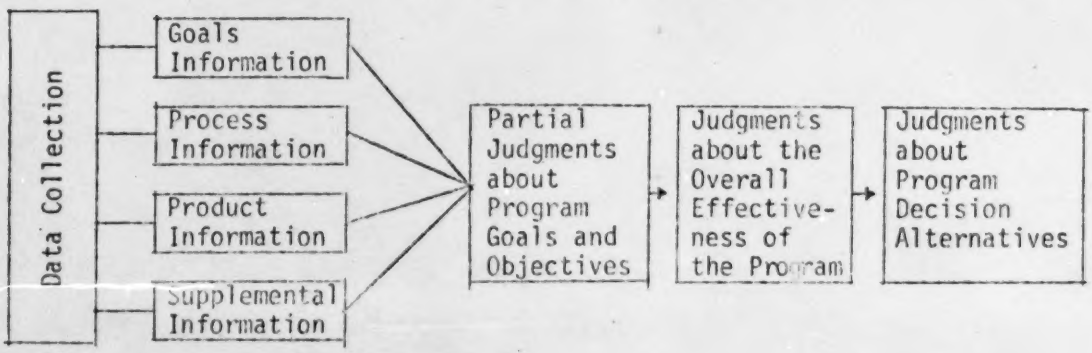
Evaluation Design

The evaluation design was simple and descriptive. It involved a group which was exposed to the program and postested. This was conducted for two years which means that the same study was done for two groups. Participants' posttest performance was interpreted in terms of pre-established criteria and the mean test performance. Thus, the evaluation design provided some general information about program goals and ojbectives attainment but no cause-effect relationships information was generated.

The evaluation study involved the collection of information for judging the degree to which program goals and objectives were attained. This in turn provided the basis for determining the overall effectiveness of the program and for judging decisions about it. Figure 1 illustrates the evaluation process.

Figure 1

Diagram of the Evaluation Process



The data needed in the evaluation study was referred to as goals information, process information, product information and supplemental information. The first included data about general aspects of the program that were essential for judging the degree to which its goals were attained. The process information included specific aspects of the program development such as admission criteria at the various levels, course content, teaching processes and the criteria used at the various exit points. The product information referred to data needed to ascertain the degree to which students attained the knowledge and skills necessary to perform at the three exit levels of the program. The supplemental information included the opinions and reactions of all the relevant audiences such as students, instructors and professional organizations.

Goals Information

This category included information about the selection and success rates in each level of the program. It also included data about drop-outs and their reasons and personnel operational costs. Most of this information was obtained from the institutional records.

Process Information

Two aspects were included in this category: (1) admission criteria, and (2) instructors and courses.

Admission criteria

This aspect included all the information necessary to determine the predictive value of admission criteria for Level I. Predictive value of admission criteria for Level II was not determined since only eight (8) students are admitted to that level each year. This value is not meaningful for a small number of subjects.

The admission criteria considered for Level I were: H.S.G.P.A., scores of an interview, College Entrance Examination Board test scores (sum of verbal aptitude, quantitative aptitude and English achievement scores), English Reading Test scores, Puerto Rican General Ability Test scores, number of high school mathematics and natural sciences courses approved, and grade point average in high school mathematics and science courses. Of these criteria only the H.S.G.P.A. and the interview were considered for the selection of candidates for the academic year 1977-78; the rest were possible criteria to be considered for the future. All this data were collected from the students' records.

The predictive value of the admissions criteria were determined by means of a multiple regression analysis. The grade point average obtained at the end of the first year of the program was considered as the predicted criterion (dependent variable).

Instructors and courses

The students' opinions about the instructors and the courses were included in this aspect. They were collected by means of two different instruments elaborated for that purpose. The first was a five point scale, going from the weakest evaluation, (1) to the highest or best one, (5). It included different aspects such as the instructor, teaching processes, content, classroom climate, interpersonal relations, and relevancy of the course within the entire program. This scale was referred to as "Opinión de las Estudiantes sobre la Enseñanza y el Curso" and was administered to the students in each course at the end of each quarter during the 1977-78 academic year.

Many weaknesses were found in the scale used for evaluating instructors and courses during the 1977-78 academic year. Thus, another instrument was developed for the 1978-79 academic year.

The second instrument was a four point Likert type scale, going from strongly agree to strongly disagree. It included the same aspects considered in the first scale and was administered by a student at the end of the 1978-79 academic year.

Product Information

Product information referred to students' achievement data. It included students grades or marks in all courses, comprehensive tests results, instructors' ratings, judgments made by dentists in practice, judgments made by graduated dental auxiliaries, and the P.R.B.D.E. certifying test results. The data were collected, organized, analyzed, and interpreted in terms of the three exit levels of the program: chairside dental auxiliary, EFDA Level I and EFDA Level II.

Grades or marks

Students' grades or marks in all courses were collected and analyzed. These data provided some basis for making some inferences about general levels of students' achievement.

Comprehensive test results

Fundamental concepts and principles acquired at the second and third exit levels of the program were measured through the use of comprehensive tests, constructed for that purpose.

Three tests were developed and used. Two were administered to students of EFDA Level I and the other was administered to students of EFDA Level II. No test was administered to the chairside dental auxiliary students.

Tests of EFDA Level I. The first test was constructed in 1978 and administered to the students of EFDA Level I during the last week of classes of the 1977-78 academic year. It was a 120 multiple-choice items test that measured knowledge and comprehension of fundamental concepts and principles expected to be mastered at that exit level of the program. Items were constructed and grouped within the test based on the academic areas included in the program. The number of items per area was determined based on the relevance and emphasis placed on each area within the program. The following is a list of areas included in the test and the corresponding items.

Area	Items' Numbers	Number of Items
Dental Anatomy	1-8	8
Oral Embryology and Histology	9-16	8
Microbiology/Oral Pathology	17-33	17
Head and Neck Anatomy	34-38	5
Expanded Functions in Restorative	39-58	20
Radiology	59-70	12
Chairside Assisting/Dental Materials/ Dental Procedures	71-100	30
Preventive Dentistry	101-112	12
Dental Office Management/Ethics and Jurisprudence	113-120	8
	Total	120

Some limitations were found in administering, scoring and analyzing this comprehensive test. Therefore, it was revised and the new test was administered at the last week of classes of the 1978-79 academic year. Some items of the original test were retained in the revised instrument,

others were eliminated, some were modified, and new items were incorporated. The revised test also had a multiple choice format but it included more items (218 items). The distribution of items per area of the revised test was as follows:

Area	Items' Numbers	Number of Items
Head and Neck Anatomy	1-20	20
Chairside Assisting/Dental Materials/ Dental Procedures	21-50	40
Microbiology/Oral Pathology	61-80	
	141-160	40
Dental Anatomy	81-100	20
Radiology	101-120	20
Oral Embryology and Histology	121-140	20
Preventive Dentistry	161-180	20
Dental Office Management/Ethics and Jurisprudence	181-199	19
Expanded Functions in Restorative	200-218	19
	Total	218

Test of EFDA Level II. This test was constructed in 1979 and administered to the students of EFDA Level II during the last week of classes of the 1978-79 academic year. It was a 166 multiple choice items test that measured knowledge, comprehension and some application of fundamental concepts and principles studied in different courses of the second year of the program. Items were constructed and grouped within the test based on the areas included in the second year of the program. The number of items in each area was based on the relevance and emphasis placed on each area within the program. The following list presents the areas and the corresponding items.

Area	Items' Numbers	Number of Items
Anatomy and Physiology	1-20	20
Dental Public Health and Critique of Dental Literature	21-40	20
Dental Health Education	41-59	19
Biochemistry and Nutrition	60-78	19
General Inorganic and Organic Chemistry	79-98	20
Advanced Preventive Dentistry	99-118	20
Pharmacology	119-138	20
Periodontics	139-158	20
Special Needs Patients	159-166	8
	Total	166

Instructors' ratings

Skills expected to be acquired by each student at each exit level were rated by some instructors through the use of scales constructed for that purpose. Three scales were developed taking as frame of reference the main tasks expected to be mastered at each exit level. Each scale included several items where the premise described one or several related skills.

The scale for Level I, Track A consisted of 30 items; the scale for the EFDA Level I included 43 items and the scale for the EFDA Level II had 16 items.

One of four alternatives were to be chosen by the raters (instructors) to describe the behavior of the student as regards the skill or skills under consideration. The alternatives were: 3- Acceptable, almost perfect; 2- Acceptable, but needs little improvement; 1- Unacceptable; N/A- there is no evidence for rating this skill or set of skills.

Ratings were made by item rather than by student, that is, all the students were rated on the same item before proceeding to the next one. This make possible to maintain a more uniform standard for judging the

students in each item and to prevent the halo effect that might result from rating each student on all items at once.

Judgments made by dentists in practice

General judgments made by dentists in practice of the performance on the job of the dental auxiliaries graduated from this program and other judgments about the preparation of this professional were expected to be collected. A questionnaire was prepared for that purpose and sent to those dentists working with graduated dental auxiliaries. It included multiple-choice and open ended questions.

Unfortunately, these data were not collected since only three dentists replied.

Judgments made by graduated auxiliaries

General judgments about this program and the working conditions made by graduated auxiliaries who were working were collected through the use of a questionnaire prepared for that purpose. The instrument mostly consisted of questions followed by possible answers. The respondents were asked to select the answer or answers applicable to them. The questionnaire also included some open ended questions and was sent to graduated dental auxiliaries by May, 1979.

Puerto Rico Board of Dental Examiners Certifying Tests Results

The results of the P.R.B.D.E. certifying tests were obtained and used as indicators of the quality of the product of this program.

The tests had a theoretical and a practical part. It included the knowledge and skills the Board considers essential for certifying dental auxiliaries and dental hygienists in Puerto Rico.

Supplemental Information

Supplemental information included opinions and reactions of all relevant audiences, e.i., students, instructors, the Advisory Committee and the Commission on Dental Accreditation of the American Dental Association. This information was obtained through meetings with these audiences and through written reports made by the Advisory Committee and the Commission on Dental Accreditation.

Findings

Goals Information

The Puerto Rico Experimental Model Dental Auxiliary Training Program admitted 32 out of 252 applicants for the first trimester of the 1977-78 academic year. This represented a selection rate of .13, which means that the probability of selecting successful students was high. The success rate* for that group was .88. Thirty eight (38) out of 154 applicants were admitted for the first trimester of the 1978-79 academic year, which represents a selection rate of .25. The success rate for that group was .82.

The program offered three career options in the dental auxiliary field. Most students admitted in the first trimester applied for the EFDA Level I option during the period of 1977-79. In that academic year 28 students applied for that option and 17 of them (61 percent) were admitted. The rest (11 students) entered into the traditional chairside option. Thirty two (32) students already enrolled in the program applied for the EFDA Level II option in the 1978-79 academic year. Twelve (12)

*Success rate means the proportion of students who were admitted and successfully completed all program requirements.

of them were admitted, which represents a percentage of 38; the rest (20 students) entered into the traditional chairside option.

An opportunity was offered in this experimental model for those traditional dental auxiliaries in the work force who wish to continue their training in order to become an EFDA in basic preventive and restorative dentistry. In 1977-78 academic year five (5) dental auxiliaries of the work force applied and three (3) were admitted (60 percent). Seventeen (17) dental auxiliaries applied in the 1978-79 academic year and four (4) were admitted, which represents a percentage of 24.

The last option of the program was the EFDA Level II which started in the 1978-79 academic year. Thirteen (13) students from the EFDA Level I applied for it, and seven (7) were admitted (54 percent). Five EFDAs in basic preventive and restorative from the work force applied. Two of them qualified, but they declined the admission due to unexpected difficulties.

During the two years project, sixty six (66) participants completed their formal education as traditional chairside auxiliary, thirty four (34) completed their formal education as EFDA in basic preventive and restorative and seven (7) completed their formal education as EFDA in advanced preventive and periodontics. Twelve (12) students dropped during the first trimester of the two year period, which represents an attrition percentage of 17. On the other hand, one dropped during the third trimester, which represents a 3 percent of those students registered. The overall attrition rate was 17 percent.

Data about the relationship between students admitted and those who completed program requirements for different options are included in table 1.

Table 1

Relationship Between Students Admitted and
Those Who Completed Program Requirements
for Different Program Levels

1977-1979

Entrance Point	Year	Admitted	Withdrawals	Failures	Completed
First Trimester of Basic Training	1977-78	32	5	0	27
	1978-79	38	7	0	31
	Total	70	12	0	58
Traditional Chairside	1977-78	11	0	0	11
	1978-79	20	0	0	20
	Total	31	0	0	31
EFDA Level I (Track B)	1977-78	20*	0	0	20
	1978-79	16**	1	1	14
	Total	36	1	1****	34***
EFDA Level II	1977-78	0	0	0	0
	1978-79	7	0	0	7
	Total	7	0	0	7

*Three of them were from work force.
**Four of them were from work force.
***They also have the traditional chairside training.
****She completed the traditional chairside training.

Academic deficiencies were the main reason for most student drop-outs. Table 2 shows the number of students who dropped for various reasons.

Table 2

Relationship Between the Number of Students Who Dropped and the Reasons

1977-1979

Reason	Academic Year		
	1977-78	1978-79	Total
Academic deficiencies	3	4	7
Illness	1	1	2
Family difficulties	0	1	1
Transfer to other program	0	1	1
Unknown reasons	1	1	2
Total	5	8	13

The structure of the new program allowed for the integrated utilization of personnel from the dental assisting and dental hygiene traditional programs. Personnel operational cost per year of the former was $247,999, while the cost of the latter was $189,474. Faculty from other medical sciences units offered one thousand and eighty six (1,086) additional contact hours in 1974-75 academic year, while the same figure for 1978-79 was one hundred four (104) hours. Dollar devaluation from 1974 to 1979 has not been considered in this cost analysis and data were not available for other operational costs.

Process Information

Admission Criteria

The main factor considered for admission was the H.S.G.P.A. It was complemented by an interview in which the applicants evidenced their motivation toward the professional field, personal characteristics, and occupational experience and knowledge. The interview was categorized according to several criteria and a score was produced. Although it was utilized as an admission criterion for the 1977-78 academic year, it was discarded as a main factor for future admissions due to the low variance and the low discriminating power of the score given by the interviewers.

The predictive validity of the H.S.G.P.A. was examined along with other factors which were available for all program participants of the 1977-78 academic year. All these factors were analyzed through the use of a computer program on multiple regression. The G.P.A. at the exit levels of the first year was considered as the dependent variable.

The following is a summary of findings of the multiple regression analysis and identification of variables:

$^{*}r_{1,2} = 0.41$

$r_{1,3} = 0.18$

$r_{1,4} = 0.31$

$r_{1,5} = 0.45$

$r_{1,6} = 0.34$

$r_{1,7} = 0.15$

$r_{1,8} = 0.05$

$^{*}r_{1,2}$ means correlation between variables X_1 and X_2.

The multiple correlation coefficient was 0.57, significant at 0.01 level which means that a prediction formula based on these variables is applicable.

The following were the variables included in the analysis:

X_1 : G.P.A. in the Dental Auxiliary Program

X_2 : High School grade point average

X_3 : General score in the College Entrance Examination Board Test

X_4 : Number of High School credit units in science and mathematics

X_5 : Raw score of the Test of English Reading (Prueba Interamericana de Lectura en Inglés)

X_6 : G.P.A. in all science and mathematics courses in high school

X_7 : Spatial Relations sub test of the Test Puertorriqueño de Habilidad General

X_8 : General ability - total raw score of the Test Puertorriqueño de Habilidad General

The previous analysis showed that most predictors used or recommended for admission have a significant relationship with academic success as measured by the G.P.A. in the dental auxiliary program.

Instructors and Courses

Students evaluated all courses by responding to a questionnaire on different aspects of each course, i.e., the instructor, teaching processes, content, classroom climate, interpersonal relations, and relevancy of the course within the entire program. A five point scale was applied during the 1977-78 academic year, going from the weakest evaluation, (1) to the highest or best one, (5).

The average evaluation in 1977-78 ranged from 4.00 to 4.50 for all courses except Psychology where students expectations were not in accordance with the course content and approach. The average value given to this course as a whole was 3.1.

Students evaluated all courses of the 1978-79 academic year by responding to a Likert type scale but results are not included in this report since the computer analysis had many errors.

Product Information

Achievement was evaluated by means of students' course grades, the comprehensive test results, instructors' ratings, judgments made by graduated dental auxiliaries, and by the P.R.B.D.E. certifying test results.

Grades Distribution

Course grades were used as students' achievement criteria. A distribution of these grades by year, students and courses is presented in Appendices L to P. Grade point averages in the 1977-78 traditional chairside dental auxiliary group ranged between 2.26 and 3.07 with a mean of 2.78 and a median of 2.68, while the grade point average in the 1978-79 group ranged between 2.26 and 3.51 with a mean of 2.91 and a median of 2.95. The same data in the 1977-78 EFDA level I group ranged from 2.80 to 3.90 with a mean of 3.23 and a median of 3.20 while the grade point averages in the 1978-79 group ranged between 2.87 and 3.58 with a mean of 3.26 and a median of 3.28.

Grade point averages for EFDA level II ranged from 2.9 to 3.9, with a mean of 3.53 and a median of 3.70.

During the 1977-78 academic year five (5) students dropped; three (3) of them for academic deficiencies. In 1978-79 eight (8) students dropped; four (4) of them for academic deficiencies. Only one student failed to meet the requirements of one course, thus failing to achieve the requirements for the certificate as EFDA level I.

Comprehensive Test Results

A comprehensive test was administered at the end of the 1977-78 academic year to all students (17) of EFDA level I. The test measured knowledge and comprehension of basic concepts and principles. The maximum possible score was 120 with a minimum passing score of 84 (70 percent). The results ranged from 104 to 78, with a median of 96, a mean of 94.53, and a standard deviation of 6.61. The frequency distribution was negatively skewed, which is an indicator of high achievement as reflected by the test. Only one student was below the minimum level. The frequency distribution of the test scores is included in Table 3.

The reliability of the test was estimated to ascertain the degree to which the test results were consistent. Kuder-Richardson coefficient (KR-20) was 0.76, which is considered slightly high.

The item analysis of the test showed coefficients of difficulty ranging from 0.5 to 1.00. The median coefficient was 88.9 which indicated that students could answer correctly most of the items.

Table 3

Frequency Distribution of the Comprehensive Test Scores of EFDA Level I 1978

Score	Frequency	Percent
104	1	86.66
103	1	85.83
101	2	84.16
98	2	81.66
97	2	80.83
96	1	80.00
94	2	78.33
93	1	77.50
90	2	75.00
89	1	74.16
84	1	70.00
78	1	65.00
Total	17	

Two different comprehensive tests were administered at the end of the 1978-79 academic year to the students of EFDA Level I and to the students of EFDA Level II. Table 4 shows the frequency distribution of the test scores of EFDA Level I. The scores ranged from 178 to 102 with a median of 160, a mean of 153, and a standard deviation of 21.40. The distribution was highly heterogeneous and skewed in the direction of the low scores. The maximum possible value was 218 and the minimum passing

value was 153 (70 percent). Five out of 17 students (29.41 percent) obtained scores below that minimum.

Table 4

Frequency Distribution of the Comprehensive Test Scores of EFDA Level I 1979

Score	Frequency	Percent
178	1	81.65
176	1	80.70
172	1	78.90
171	1	78.40
170	2	77.78
164	1	75.20
161	1	73.85
159	1	72.93
157	1	72.01
153	1	70.18
144	1	66.05
131	1	65.60
124	1	56.88
120	1	55.04
102	1	46.80
Total	16	

The comprehensive test results of EFDA Level II are summarized in Table 5. The highest score was 111 and the lowest score was 101, with a median of 105, a mean of 105.7 and a standard deviation of 3.2. The frequency distribution was highly homogeneous. The maximum possible score was 166 and the minimum passing score was 116 (70 percent). All the students are below the minimum passing level.

Table 5

Frequency Distribution of the Comprehensive Test Scores of EFDA Level II 1979

Score	Frequency	Percent
111	1	66.90
108	1	65.00
106	1	63.90
104	2	62.70
101	1	60.80
Total	6	

Instructors' Ratings

Tasks or skills necessary to perform adequately at each exit level of this program were rated by some instructors. Ratings were recorded in scales prepared for that purpose.

Three groups of students were rated during the 1978-79 academic year. The first group were students from the chairside dental auxiliary level. Total rating scores in this group ranged from 50 to 33 with a mean score of 41.14 and a standard deviation of 5.54. The mean score per item ranged from 1.83 to 2.77. Only one out of 21 students obtained a mean

score per item below 2, which means that the skills of 95 percent of students in the first group were rated between acceptable (score = 2) to almost perfect (score = 3). The rating scale scores distribution is shown in Table 6

Table 6

Rating Scale Scores for Traditional Chairside Dental Auxiliary 1978-79

Score	Frequency	Mean Score*
50	2	2.77
49	1	2.72
48	1	2.66
47	2	2.61
45	2	2.50
44	1	2.44
38	4	2.11
37	2	2.05
36	5	2.00
33	1	1.83

*Mean score per item

The second group were students from EFDA Level I. Ratings in this group are summarized in Table 7. Total rating scores ranged from 100 to 78 with a mean score of 90.46 and a standard deviation of 5.43. Mean score per item ranged from 2.29 to 2.94, which means that the skills of all the students in the group were rated acceptable to almost perfect.

Table 7

Rating Scale Scores for EFDA Level I
1978-79

Score	Frequency	Mean Score*
100	1	2.94
97	1	2.85
96	1	2.82
95	2	2.79
93	1	2.74
91	3	2.68
90	2	2.65
89	1	2.62
82	1	2.41
79	1	2.32
78	1	2.29

*Mean score per item

The third group were students from EFDA Level II. Ratings in this group were highly homogeneous. Total rating scores ranged from 35 to 45, with a mean of 39.57 and a standard deviation of 3.74. The mean score per item ranged from 2.50 to 2.81. Thus, the skills of these students were highly rated. Table 8 shows rating scores for this group of students.

Table 8

Rating Scale Scores for EFDA Level II
1978-79

Score	Frequency	Mean Score*
45	1	2.81
44	1	2.75
42	1	2.62
38	1	2.71
37	1	2.64
36	1	2.57
35	1	2.50

*Mean score per item

Judgments Made by Graduated Auxiliaries

The questionnaire designed to measure judgments about this program and job conditions was sent to 51 graduated dental auxiliaries who were working by May, 1979. Thirty one (31) were from 1978 class and 20 were from the chairside dental auxiliary level of 1979 class. Twenty three dental auxiliaries (45 percent) replied.

Most dental auxiliaries who replied (89 percent) viewed themselves as well prepared for their duties by the time they started working. Eighty nine (89) percent also indicated that, in general, knowledge acquired in the courses have helped them in their work and that, to a great extent, skills developed in laboratories and clinics have helped them.

The majority of the dental auxiliaries demonstrated complete satisfaction with their duties, with the dentist's and patients' treatment and with

the equipment and other facilities they have in their job setting. On the other hand, most of them indicated moderately satisfaction or insatisfaction with the salaries they earn. Table 9 shows the expressed degrees of satisfaction by aspect.

Table 9

Degrees of Satisfaction by Aspect Expressed by Graduated Dental Auxiliaries

Aspects	Degree of Satisfaction							
	High		Moderate		Low		Total	
	N	%	N	%	N	%	N	%
Duties	15	83	3	17	0	0	18	100
Dentist's treatment	13	72	4	22	1	6	18	100
Clients' treatment	16	89	2	11	0	0	18	100
Equipment	15	83	3	17	0	0	18	100
Salaries earned	6	33	8	45	4	22	18	100

Puerto Rico Board of Dental Examiners Certifying Tests Results

The results of the P.R.B.D.E. certifying tests are summarized in Table 10. Ninety two (92) percent of the students from this program who took the exam in 1978 passed the tests and were certified as Dental Auxiliary. The corresponding percent in 1979 was 86.2. On the other hand, only 15.4 percent of the examinees from other programs passed the tests in 1978 and 50 percent in 1979.

Table 10

Comparative Analysis of the Results of the Puerto rico Board of Dental Examiners Certifying Test

1978 and 1979

Program	Year	Examined		Approved		Failed	
		N*	%	N	%	N	%
Medical Sciences Campus of the University of Puerto Rico	1978	24	100	22	92.0	2	8.0
	1979	29	100	25	86.2	4	13.8
	Total	53	100	47	88.7	6	11.3
Others in Puerto Rico	1978	26	100	4	15.4	22	84.6
	1979	10	100	5	50.0	5	50.0
	Total	36	100	9	25.0	27	75.0

*N is the number of examinees.

All the students (7) graduated in 1979 from the EFDA Level II option took the Certifying exam for Dental Hygienists. Six of them passed the tests and were certified.

Supplemental Information

The Advisory Committee Comments and Suggestions

The Advisory Committee made a continuous and progressive evaluation of the program since its beginning. They met four times in Puerto Rico with the project officer, project director, staff members and suggested curriculum modifications. The main resultant changes from those meetings were basically in course content, sequence and time allocation for specific content areas.

The specific comments and suggestions made by this group are included as Exhibit G.

Evaluation of the Commission on Dental Accreditation of the American Dental Association

An evaluation of the dental assisting and dental hygiene program was conducted on October 2-4, 1978, by a committee of the Commission on Accreditation of Dental and Dental Auxiliary Educational Programs. The Traditional Chairside Dental Auxiliary level was not considered for accreditation due to its "length and curriculum content". The EFDA Level I was granted a conditional approval and the accreditation eligible status for the EFDA in advanced preventive and periodontics level was denied. See Exhibit H.

An advisory group meeting was convened and representatives of the American Dental Association were invited to discuss implementation of the recommendations contained in the accreditation eligible site visit report. The decision was made by the institution to concentrate its efforts on preparing for another site visit rather than appeal the denial of accreditation eligible status. Prior to the site visit a curricular analysis of the 01 and 02 year curriculum was made. A weekly display of curriculum content and sequence was worked out by the program's staff to assess program's scope, depth and sequence. See Exhibit I.

On February 8, 1979, the Project Director visited the American Dental Association headquarters to discuss the Commission's recommendations. See Exhibit J.

Changes were made to the program mainly in the areas of equipment and curriculum. Three months of clinical enrichment were added to Level I.

The site visit committee conducted a pregraduation evaluation of the dental hygiene program and a special reevaluation of the dental assisting program on March 7-9, 1979. In May 1979, the project director scheduled an appearance with the Commission's review committee on dental hygiene

prior to consideration of the program. The Commission granted the accreditation status of "approval" to the dental assisting program which includes the traditional chairside dental assisting level (Level I, Track A) and the EFDA in basic and preventive and restorative level (Level I, Track B). The Commission granted conditional approval to the EFDA in advanced preventive and periodontics level (Level II) with the following recommendations: See Exhibit K.

1. It is recommended that clinical equipment used by the dental hygiene students be modified to provide adequate patient positioning throughout all dental hygiene clinical procedures.
2. It is recommended that the clinical course sequence be revised to increase the total number of prophylaxes completed prior to graduation.
3. It is recommended that the faculty continue the refinement of the clinical evaluation mechanism to include process evaluation throughout the clinical course sequence.
4. It is recommended that the institution submit to the Commission any changes in the curriculum goals or materials as a result of the implementation and revision of the proposed curriculum.

A progress report on the implementation of these recommendations was sent to the Commission by March, 1980 and discussed into the May, 1980 meeting. The Commission granted the accreditation status of "approval" to the EFDA Level II (dental hygiene) program.

The accredited program's scope, sequence and course outlines are included in Exhibit L.

Faculty Recommendations

The members met periodically to evaluate the development of the program. As a result of those evaluations, specific recommendations were made which resulted in pertinent changes.

Discussion of Findings

Goals Information

The findings of this assessment suggest that the program goals were attained. The experimental model allowed participants to successfully complete formal education at various levels: traditional chairside auxiliary, EFDA in basic preventive and restorative and EFDA in advanced preventive and periodontics. An associate degree was granted to the last level. The successful performance of the graduates from the different levels was evidenced by the instructors' ratings and the results of the P.R.B.D.E. certifying tests. Thus, goals 1, 2, 3 and 8 were accomplished.

Opportunities were provided in a limited way for traditional dental auxiliaries in the work force to continue further preparation as EFDAs, fulfilling goal 4. The attainment of goal 5 was not confirmed due to the fact that practicing dentists did not reply to the questionnaire designed for that purpose.

The structure of the program allowed for the integrated utilization of the personnel of the dental assisting and dental hygiene traditional programs, lowering the personnel operational costs. Although data about the rest of the costs were not available, it is reasonable to assume that they were lower since the program length was reduced. Therefore, goals 6 and 7 were accomplished.

The Commission on Dental Accreditation accredited the dental assisting and dental hygiene phases of the experimental model with some modifications. These modifications were made following their respective evaluation in terms of the Commission's separate accreditation standards for dental assisting and dental hygiene educational programs. Its main innovations were retained, i.e., the integrated three career options and the program length reduction. This provides a model for the development of similar EFDAs training programs within continental U.S.A., attaining in this way program goal 9.

Process Information

The multiple regression analysis of the variables which were considered as possible criteria for admission showed that some of them have relatively high predictive power and others are poor predictors. The variables that demonstrated the highest correlation with the exit G.P.A. are the following, in decreasing order:

1. Test of English Reading - (Prueba Interamericana de Lectura en Inglés)
2. High school grade point average
3. Grade point average in high school science and mathematics courses
4. Number of credit units in science and mathematics taken in high school

The contribution of these four variables to the criterion G.P.A. is high enough to keep them as admission criteria. Although the interview showed a low correlation, we still think that is is another good predictor. Nevertheless, we must find a practical scoring device in order to make it highly discriminating.

The general score of the College Entrance Examination had an unexpected low correlation with the G.P.A. Previous studies have demonstrated that it has a relatively high predictive vailidity for other college programs. Therefore, further analysis of its predictive value is necessary before it is established as an admission criterion.

The students made very positive courses evaluation as revealed by analysis of the instrument constructed for that purpose. Most courses had a typical score above 4.0 on a one to five point scale. Nevertheless, we could pin point several weaknesses on different aspects of the courses through the analysis of students responses. The instrument also had few weaknesses which were corrected later.

Product Information

Four sources of information for evaluating students' achievement--grades distribution, results of comprehensive tests, instructors' ratings and the results of the Puerto Rico Board of Dental Examiners certifying tests--showed that students successfully mastered the necessary knowledge and skills for the three exit levels. In 1978 only one student failed to achieve the passing score of the comprehensive test for EFDA Level I which was fixed at 70 percent. In 1979, five students (29 percent) failed to achieve the passing score. There are some possible explanations for the increase in test failures observed between 1978 and 1979. This increase could be due to differences in tests difficulty levels. It is assumed that the test administered in 1979 had a higher difficulty level. The increase in test failures might also be due to lower actual knowledge achievement in the 1978-79 group. Although the values of the initial academic variables (high school G.P.A. and CEEB test results) were similar, the faculty pointed out differences in academic achievement between the two groups.

Surprisingly, the seven students of EFDA Level II did not obtain the minimum passing score in the comprehensive test, having a highly homogeneous frequency distribution. These students were perceived by the faculty as high achievers.

The EFDA Level II test results might be explained in terms of the test difficulty level and/or the actual academic achievement. The test was viewed by the faculty as moderately difficult since it mostly included the two lower levels of the cognitive domain: knowledge and comprehension. An empirical study of the test difficulty was necessary in order to prove this, but it was impossible because the population for which the test was applicable was very small.

It can also be hypothesized that the EFDA Level II students did not attain the expected minimum cognitive achievement level but it was not possible to test this hypothesis.

The analysis of students' grades distribution also evidenced high academic achievement. Mean G.P.A.s in the different options were above 2.5.

All students, except one, mastered the expected tasks or skills to perform adequately at the corresponding exit level, as measured by instructors' ratings. Their performances were rated between acceptable to almost perfect. The lowest ratings were for students of the traditional chairside level. This finding was expected since highest achievement students are admitted to higher levels.

Dental auxiliaries who graduated in 1978 and 1979 perceived themselves as well prepared for their duties by the time they started working and were satisfied with the program. This finding also demonstrated that the program was successful in attaining its expectations.

The results of the P.R.B.D.E. certifying tests were consistent with all the previously discussed findings, that is, most students demonstrated the knowledge and skills necessary to perform as dental assistants and dental hygienists. Even more, the experimental model students performed much higher than those of other programs in the Island.

All these findings suggest that most students of this experimental model attained, in the specified time, the necessary knowledge and skills to perform adequately at the three dental auxiliary exit levels. Nevertheless, it was necessary to add three more months of clinical enrichment to the six month track in order to meet the minimum standards for accreditation purposes.

The attrition rate in this program was expected to be lower than in the traditional ones since time and competencies to be developed were reduced in the first level. Surprisingly this was not the case. The attrition rate increased from 15 percent in the traditional programs to 17 percent in the experimental one.

The causes for the attrition rate were not clearly known. Nevertheless it was hypothesized that although time and competencies to be mastered were reduced, the program was highly demanding. Even more, it is possible that the academic requirements of the experimental model were higher than those of the traditional programs.

An accreditation committee of the Commission on Accreditation of Dental and Dental Auxiliary Programs submitted recommendations and changes were made in the program for accreditation purposes. The committee did not consider the findings of the evaluation study as they were not ready at that time.

SECTION VI. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The program was effective in attaining the goals and objectives that were initially proposed. This curricular model could prepare three types of dental auxiliaries needed in the dental practice in the proposed minimum amount of time. Most participants mastered the expected knowledge and skills.

These conclusions are derived from the general findings of the evaluation study and could have been more firm if a more sophisticated evaluation design would have been used. It should have included experimental and control groups.

Recommendations

As a result of the evaluation study the following recommendations are suggested:

1. Accreditation process should not be considered for experimental or demonstrative programs until an evaluation study have been completed.
2. Private and governmental extramural practices should be instituted in the curriculum in order to develop skills that could not be developed in this institution educational setting.
3. An experimental study should be conducted in order to determine if a significant positive change occurs in this program which will not be observed in the traditional one.
4. A study should be done in order to determine the attrition causes.